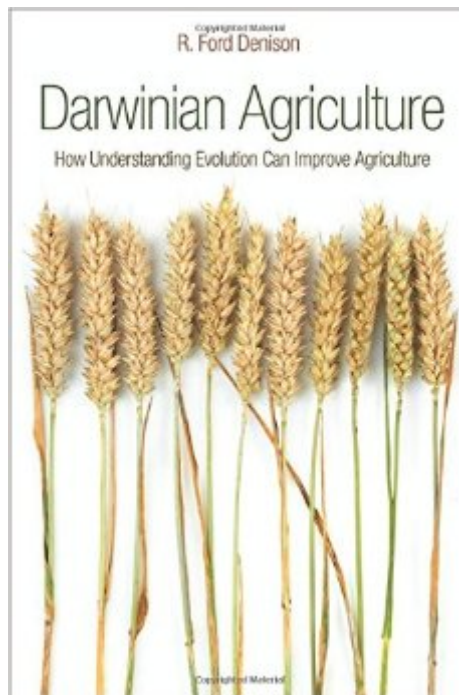


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# Darwinian Agriculture: How Understanding Evolution Can Improve Agriculture



## Synopsis

As human populations grow and resources are depleted, agriculture will need to use land, water, and other resources more efficiently and without sacrificing long-term sustainability. Darwinian Agriculture presents an entirely new approach to these challenges, one that draws on the principles of evolution and natural selection. R. Ford Denison shows how both biotechnology and traditional plant breeding can use Darwinian insights to identify promising routes for crop genetic improvement and avoid costly dead ends. Denison explains why plant traits that have been genetically optimized by individual selection--such as photosynthesis and drought tolerance--are bad candidates for genetic improvement. Traits like plant height and leaf angle, which determine the collective performance of plant communities, offer more room for improvement. Agriculturalists can also benefit from more sophisticated comparisons among natural communities and from the study of wild species in the landscapes where they evolved. Darwinian Agriculture reveals why it is sometimes better to slow or even reverse evolutionary trends when they are inconsistent with our present goals, and how we can glean new ideas from natural selection's marvelous innovations in wild species.

## Book Information

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## Customer Reviews

• Darwinian Agriculture • is a brilliant book by a terrific scientist. The book flap does not do justice to his credentials. For example, for 10 years he directed the Long Term Research on Agricultural Systems project as a professor at UC Davis, also supervising PH.D. students. Denison

writes clearly, but the book is somewhat densely written, and it definitely helps if the reader already has some familiarity with evolutionary concepts. In this book Denison is concerned not just with what is true, but also what is untrue, and why some experiments and analogies have been misleading. I find him completely objective. Denison is interested in the problem of increasing yield sustainably, where yield is the amount produced per scarce resource whether that resource be land, water, fertilizer. Sustainability may depend on your time horizon: the ancient mid-east suffered declining yields over a millennium as the use of irrigation slowly built up the salt content of the soils due to evaporation. Denison worries both about feeding an ever expanding population, and dealing with short term catastrophes such as a major volcanic eruption blocking sunlight. I was amazed that according to a book cited by Denison (note 7), the world had only a 7 week supply of grain in storage in 2007. According to Denison's sources (p.59), genetic improvement has had little impact on potential yield (i.e. in the absence of pests/weeds) of the 3 major crops (wheat, rice, corn) since 1980. Nature has had a long time to find simple mutations which increase yield.

This book is one very much worth reading for anyone interested in the future of feeding people. It might not please anyone mindlessly dedicated to one easy solution or thinking that certain approaches are foolish or evil (both biotechnology approaches and total imitation of nature get strongly criticized, but neither is dismissed entirely, either), but the book convincingly presents an argument that evolutionary theory has a lot to contribute in how we look at agricultural solutions, no matter the political angles taken or the pet cause wanting to be promoted. Denison's explanations are clear and thoughtful, and he keeps the content fairly approachable for anyone interested in the topic, not just academics (although if one is an academic, there are plenty of references to read for greater detail). He also has just the right amounts of confidence and humility - he gives his hypothesis of three principles (or two and an opinion) and his evidence, but he honestly presents objections and possible counter-examples and admits he could be wrong, even if he thinks he's right. In other words, he comes across like a scientist, which is not common enough in the genre of food, agriculture, and environmental writing. I particularly appreciated what Denison had to say about the benefits of diversity in the system (the principle that was more his opinion rather than a hypothesis forming a principle), even if that means backing off of maximizing yield all the time. I come from a different academic direction from Denison, but arrive at much the same conclusion on this topic (diversity is a strong concept when modeling resilience in economics as well as ecology).

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